Refrigeration and Air-conditioning Technology

Climate change, the greenhouse effect and global warming – in the 21st Century there is scarcely any other subject that is more ubiquitous or "hotly" debated. Global environmental accords like the international Kyoto protocol or specifically the European directive on fluorinated gases are devoted to the problems associated with greenhouse relevant agents and the search for solutions on a political level. Refrigeration and air-conditioning applications amplify the effects of global warming.

In the first place they contribute directly and in a big way to the greenhouse effect through the emission of coolants containing fluorine like partially or wholly fluorinated hydrocarbons. One example of how these emissions are caused is because of leaks in refrigeration systems which allow coolants to escape into the atmosphere. Secondly, the operation of refrigeration systems also causes additional, indirect CO_2 emissions due to the not inconsiderable amount of energy required for their operation. This problem is compounded by the fact that demand for refrigeration systems is constantly increasing.

Lucas-Nülle has committed itself to this subject and developed a concept to integrate easily serviceable and effective training systems devoted to this growing sector. Refrigeration and air-conditioning technology is a professional area that builds entirely the latest educational and technical know-how. It is the many years of experience that Lucas-Nülle has accumulated combining theoretical know-how with practical applications which empowers course participants to boost their skills and competence in this area.

Open- and closed-loop control in refrigeration and air-conditioning systems

Open- and closed-loop control in refrigeration and air-conditioning systems

This set is designed for training in the fundamentals of process control systems for refrigeration and air-conditioning systems. Trainees, student professionals and technicians from refrigeration and air-conditioning companies with training related to their profession are guided step by step through open- and closed-loop control techniques as used in refrigeration and air-conditioning and acquire a high-quality grounding for their work in the future. The combination of theory and practice ensures they get solid training.

RCC12 Compressor control
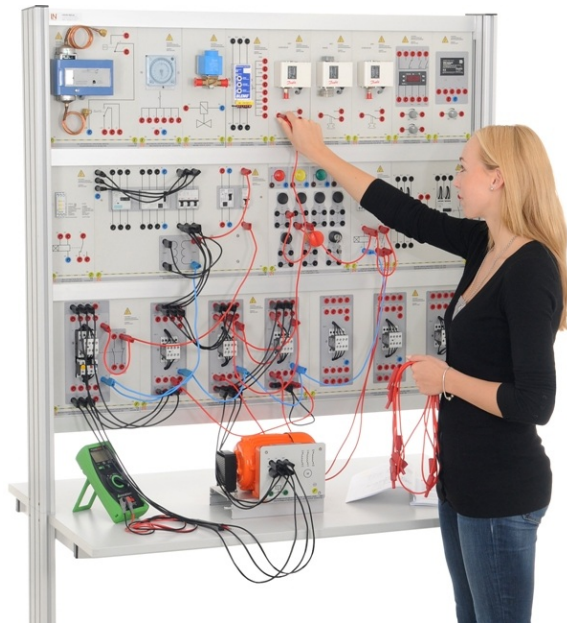
RCC12 Compressor control

One of the main components in a refrigeration system is the compressor. This needs to be controlled along with its drive motor in a way that fits the application. The compressor control course covers and conveys the various methods for shutting down and running up compressors in refrigeration and air-conditioning systems. These methods are used on a daily basis in genuine systems and count as basic knowledge for refrigeration technicians.

Training contents:

- Pump-down compressor control with part winding starting system
- Pump-out compressor control with starting system
- Compressor control system with two speeds
- Turning on three-phase motors directly
- Turning on star-delta motors

Equipment set comprising the following:

Solenoid valve for switching various circuits CO3209-5S 1

Servo-backed solenoid valve for liquid, suction or high-pressure/heated gas pipes with fluoride coolants. Suitable for all applications involving fridges, freezers or air conditioning.

- Solenoid valve type EVR6
- AC coil, 230 V/50 Hz
- Temperature of medium -40...105°C
- Permissible operating pressure 35 bars
- Inputs and outputs: 4mm safety sockets
- Dimensions: 297 x 114 x 60mm
- Weight: 0.8kg
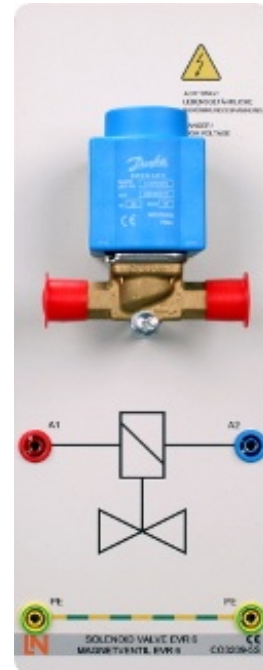
Adjustment control for coolant circuit CO3209-5T 1

Programmable temperature setting control for use in ventilated refrigerators.

- Type ID 974 controller
- Mains voltage: 230 V, 50 Hz
- 3 Digital (relay) outputs, 250 V (3 change-over contacts)
- 2 PTC or NTC inputs
- 2 Adjustable temperature simulation functions using 10-turn potentiometer
- 1 TTL input for Copy Card
- 4 Programming buttons
- 3 Programming levels
- Password protection
- Inputs and outputs: 4mm safety sockets
- Dimensions: 297 x 114 x 60mm
- Weight: 0.8kg

Time-delay relay for star-delta starting circuit

CO3209-5K   1

No need to build large control circuits if auxiliary relays are used

- Time range: 3s....60s

- Operating voltage: multi-functional 24...230VAC/DC

- Frequency: 50/60Hz

- LED function display

- Control contact: 1 change-over contact

- Inputs and outputs: 4mm safety sockets

- Dimensions: 297 x 114 x 60mm

- Weight: 0.8kg
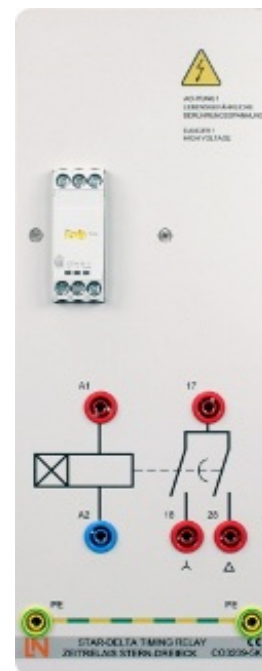
Three-phase asynchronous motor, squirrel-cage, 1kW

SE2672-5G   1

Three-phase asynchronous motor with pronounced pull-out torque.

- Nominal voltage: 690/400V, 50Hz

- Nominal current: 1.2A / 2.1A

- Nominal speed: 2900rpm

- Nominal power: 1kW

- cos phi: 0.83

- Dimensions: 380 x 220 x 250mm (WxHxD)

- Weight: 13kg

Three-phase asynchronous machine, Dahlander, 1kW

SE2672-5K   1

Nominal voltage: 400V, 50Hz (double star connection)

- Nominal current: 2.0 / 2.8A
- Nominal speed: 1400 / 2820rpm
- Nominal power: 0.75 / 1.1kW
- cos phi: 0.82 / 0.9
- Dimensions: 380 x 220 x 250mm (WxHxD)
- Weight: 14kg

| **Three-phase-Asynchron machine part winding 1kW** | SE2673-1Q | 1 |

Three-phase-Asynchron machine part winding

- Nominal voltage: 400, 50Hz

- Nominal power rating: 1kW

- Nominal current: 2,7A

- Nominal speed: 1400rpm

- cos phi: 0.75

- Dimensions: 380 x 220 x 250mm (HxWxD)

- Weight: 14kg

Media:

| **Interactive Lab Assistant: Compressor control** | SO2801-1B | 1 |

Multimedia experiment software with virtual instruments, instructions and documentation of results for controllers in refrigeration technology

- Interactive experiment set-up
- Measurements and graphics can be copied via drag-and-drop into the experiment instruction pages
- Questions with feedback and evaluation logic for testing knowledge
- Printable document so that experiment instructions with answers can be printed easily
- CD-ROM with Labsoft browser and course software